

AMENDMENTS TO THE CLAIMS

This Listing of Claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

Claim 1 (Currently Amended): A set-up method for a loudspeaker system capable of generating at least one directed beam of audio sound, the said loudspeaker system being in a room, the said room comprising a listening position, the said method comprising ~~the steps of:~~
emitting directional beams of set-up sound signals from the loudspeaker system into the said room;
registering ~~said signals and/or~~ at least one of ~~their~~ reflection of the emitted signals at one or more locations within the said room; and
evaluating the said registered reflected signals to ~~determine a first set of directing parameters for a future audio beam~~ obtain data for use in configuring the surround sound system.

Claim 2 (Currently Amended): The method of claim 43, further comprising:
using the said directing parameters to direct the said beam of audio sound into a [[the]] desired direction.

Claim 3 (Currently Amended): The method of claim 1, wherein the said loudspeaker system comprises an array of electro-acoustic transducers.

Claim 4 (Original): The method of claim 3, wherein each signal is emitted from a single electro-acoustic transducer in the array.

Claim 5 (Currently Amended): The method of claim 3 ~~[[2]]~~, wherein each signal is emitted from a plurality of electro-acoustic transducers in the array so that the signal is emitted in a desired direction.

Claim 6 (Original): The method of claim 3, wherein different signals are simultaneously emitted from different electro-acoustic transducers.

Claim 7 (Currently Amended): The method of claim 6, wherein the different electro-acoustic transducers are located at one or both of an edge position and ~~and/or~~ the centre of the transducer array.

Claim 8 (Currently Amended): The method of claim 1, wherein the registering ~~step~~ includes ~~the step of~~ positioning at least one microphone in the said room and recording ~~the signals and/or~~ at least one of the ~~their~~ reflections using the said at least one microphone.

Claim 9 (Currently Amended): The method of claim 8, wherein the at least one microphone comprises ~~there are~~ a plurality of microphones arranged in a known geometric configuration, ~~preferably a tetrahedral configuration.~~

Claim 10 (Currently Amended): The method of claim 8, wherein the at least one said microphone is physically positioned in or on ~~in/on~~ the loudspeaker system.

Claim 11 (Currently Amended): The method of claim 1, wherein the evaluating ~~step~~ includes ~~the step of~~ determining the listening position relative to a ~~[[the]]~~ location of the loudspeaker system.

Claim 12 (Currently Amended): The method of claim 1, wherein the evaluating ~~step~~ includes ~~the step of~~ identifying multiple acoustic paths to the listening position.

Claim 13 (Currently Amended): The method of claim 12 wherein the evaluating ~~step~~ further includes assigning different audio channels to different paths.

Claim 14 (Currently Amended): The method of claim 1, wherein the evaluating ~~step~~ includes ~~the step of~~ identifying clusters of reflections in the registered reflected signals.

Claim 15 (Previously Presented): The method of claim 1, further comprising using pre-known data relating to the geometry of the room to exclude beam directions.

Claim 16 (Currently Amended): The method of claim 15, wherein the pre-known data are provided by a human operator, the said method further including ~~the step of~~ prompting for the input of the pre-known said data.

Claim 17 (Original): The method of claim 15, wherein the pre-known data are provided by a previous application of a set-up method.

Claim 18 (Currently Amended): The method of claim 1, wherein the said evaluating ~~step~~ comprises recording the time elapsed between emitting the signals and receiving a ~~[[the]]~~ first reflection at a location within the said room.

Claim 19 (Currently Amended): The method of claim ~~8~~ 10 ~~when dependent on claim 3~~, wherein the at least one said microphone is positioned at or near the plane of the said array of electro acoustic transducers, ~~preferably at the centre of said array~~.

Claim 20 (Currently Amended): The method of claim 1, wherein the said evaluating ~~step~~ comprises determining the distance of surfaces from the loudspeaker system by scanning ~~set-up~~ [[a]] sound beams beam around the said room.

Claim 21 (Currently Amended): The ~~[[A]]~~ method of ~~according to~~ claim 1, wherein only a first predetermined portion of registered reflected signals ~~received~~ are evaluated in the ~~said~~ evaluating ~~step~~.

Claim 22 (Currently Amended): The ~~[[A]]~~ method of ~~according to~~ claim 1, wherein the signals emitted from the loudspeaker system are focused using the ~~said~~ loudspeaker system such that the focus point is near to an estimated reflection surface.

Claim 23 (Currently Amended): The ~~[[A]]~~ method of ~~according to~~ claim 22, further comprising using ~~wherein~~ a feedback loop ~~is used~~ to provide that the beam focus tracks the estimated reflection surface position as the beam moves.

Claim 24 (Currently Amended): The ~~[[A]]~~ method of ~~according to~~ claim 1, wherein at least one of the ~~said~~ registered reflected signals is multiplied by a phase shifted version of the emitted signal to which it corresponds so as to discriminate signals reflected by surfaces that lie a predetermined distance from the loudspeaker system.

Claim 25 (Currently Amended): The ~~[[A]]~~ method of ~~according to~~ claim 1, wherein at least one of the ~~said~~ signals emitted by the loudspeaker system comprises a chirp signal, ~~said chirp signal preferably reducing in frequency during its duration.~~

Claim 26 (Currently Amended): The ~~[[A]]~~ method of ~~according to~~ claim 25, further comprising using ~~wherein~~ a matched filter ~~is used at the receiver~~ to decode a reflected chirp signal ~~so as~~ to improve signal to noise ratio whilst maintaining adequate range-resolution.

Claim 27 (Currently Amended): The method of claim 1, wherein the evaluating ~~step~~ includes determining the angle of reflective surfaces relative to the loudspeaker system ~~Sound Projector~~ by analysing ~~[[the]]~~ time of receipt of a plurality of reflections ~~received signals~~, each representing a ~~[[the]]~~ first reflection of a corresponding emitted ~~transmitted~~ signal.

Claim 28 (Currently Amended): The method of claim 1, wherein the evaluating step includes determining the angle of reflective surfaces relative to the loudspeaker system ~~Sound Projector~~ by analysing [[the]] relative amplitude of a plurality of reflections ~~received signals~~, each representing a [[the]] first reflection of a corresponding emitted ~~transmitted~~ signal.

Claim 29 (Currently Amended): The [[A]] method of ~~according to~~ claim 1, wherein the said evaluating step comprises analysing a change in received first reflection signal amplitude and analysing a change in time of first reflection ~~so as~~ to determine whether a [[the]] reflecting surface is continuous, planar or curved.

Claim 30 (Currently Amended): The [[A]] method of ~~according to~~ claim 1, wherein the direction of signals emitted from the loudspeaker system is set to track detected discontinuities between reflective surfaces in the room.

Claim 31 (Currently Amended): The method of claim 30, wherein the direction of signals emitted by the loudspeaker system is caused to veer to one side of an estimated discontinuity ~~so as~~ to confirm the presence of the said discontinuity in the reflective surfaces.

Claim 32 (Currently Amended): The [[A]] method of ~~according to~~ claim 1, wherein the evaluating evaluates presence of ~~it is evaluated that there is a hole~~ “hole” in a [[the]] room surface in a particular direction when no reflected signal is registered following an emission of a signal from the loudspeaker system and it is thereafter determined that audio sound signals are not directed towards the hole ~~said “hole”~~.

Claim 33 (Currently Amended): The [[A]] method of ~~according to~~ claim 1, wherein the said loudspeaker system is a surround sound system ~~intended~~ for [[the]] playback of surround sound channels.

Claim 34 (Original): The method of claim 6, wherein the signals are emitted as spatially constrained beams of sound to a range of directions, the spatially constrained beams of sound being laterally constrained to form narrow vertical beams.

Claim 35 (Original): The method of claim 34, wherein the spatially constrained beams of sound are laterally and vertically constrained to form narrow point or ellipsoidal beams.

Claim 36 (Canceled).

Claim 37 (Currently Amended): A surround sound system ~~having an at least semi-automatic set-up function, said system~~ comprising:
means for emitting directional beams of set-up sound signals;
means for registering ~~said signals and/or~~ at least one ~~of their~~ reflection of the emitted signals at one or more locations within ~~a the listening~~ room; and
means for evaluating the registered reflected signals ~~so as to obtain data for use useful~~ in configuring the surround sound system.

Claim 38 (Currently Amended): The ~~[[A]]~~ system of ~~according to~~ claim 37, wherein ~~the said~~ means for evaluating signals comprises a signal processor that outputs ~~[[the]]~~ time of first reflection of an emitted ~~a transmitted~~ signal and/or ~~[[the]]~~ amplitude of the ~~said~~ reflected signal relative to the corresponding emitted ~~transmitted~~ signal.

Claim 39 (Currently Amended): The ~~[[A]]~~ system of ~~according to~~ claim 37, wherein ~~the said~~ system is configured to firstly determine positions ~~the position~~ of the major reflecting surfaces in the room ~~in which it is located~~ and thereafter to determine ~~[[the]]~~ directions in which ~~[[the]]~~ surround sound channels will be emitted.

Claim 40 (Currently Amended): The ~~[[A]]~~ system of ~~according to~~ claim 37, wherein ~~the said~~ system comprises an array of electro-acoustic output transducers ~~for outputting directional sound beams~~.

Claim 41 (Currently Amended): The ~~[[A]]~~ system ~~of according to~~ claim 37, wherein ~~the said~~ means for registering ~~reflections~~ comprises at least one microphone.

Claim 42 (Currently Amended): The ~~[[A]]~~ system ~~of according to~~ claim 41 ~~[[40]]~~, wherein ~~the said~~ at least one microphone is positioned in ~~the said~~ surround sound system close to ~~an said~~ array of electro-acoustic output transducers.

Claim 43 (New): The method of claim 1, wherein the registered reflected signals are evaluated to determine directing parameters for use in directing a future beam of audio sound.

Claim 44 (New): The method of claim 43, wherein the emitted signals are also registered and evaluated to determine the directing parameters.

Claim 45 (New): The method of claim 9, wherein the known geometric configuration is a tetrahedral configuration.

Claim 46 (New): The method of claim 19, wherein the at least one microphone is positioned at or near the centre of the array of electro-acoustic transducers.

Claim 47 (New): The method of claim 25, wherein the chirp signal reduces in frequency during its duration.

Claim 48 (New): A surround sound system for a room comprising:
one or more loudspeakers configured to emit directional beams of sound signals;
controller electronics configured to control the loudspeakers to emit directional beams of set-up sound signals in different directions; and
a detector configured to detect reflections of the set-up sound signals at one or more locations within the room,

wherein the controller electronics is further configured to generate, based at least in part on the detected reflections, surround sound system configuration data usable in steering directional beams for surround sound channels.

Claim 49 (New): The surround sound system according to claim 48, wherein the controller electronics is configured to generate the surround sound configuration data based on earliest reflections of the set-up sound signals.

Claim 50 (New): The surround sound system according to claim 48, further comprising:

a signal processor configured to determine time lapses between the emitting of set-up sound signals and the detecting of their respective earliest reflections by the detector, and amplitudes of the respective earliest reflections, and

wherein the controller electronics is further configured to determine room shape based on the determined time lapses and amplitudes and to generate the surround sound system configuration data based on the determined room shape.